

1 the set. The same person (voice talent) records each of the
5 messages.

10 A problem with the prior art voice mail systems is that different people find different speech patterns appealing. Different people tend to like and thus better understand different voice patterns. Aspects of voice patterns include fast or slow speaking, sing-songy speaking or monotonous, pitch, dialect and the gender of the speaker. Voice patterns also can reflect different personalities of the speaker.

SUMMARY OF THE INVENTION

15 It is an object of the present invention to provide a method and apparatus for personalizing voice messages to be used by a voice mail system in interacting with a user based on information provided by the user in an interactive communication between the voice mail system and the user. The method comprises of creating a number of different sets of recorded messages according to distinct personalities and voice tones, selecting a recorded message from the different sets of messages interactive inquiries between the user and the voice mail system. In one embodiment, the selected message is further personalized by modifying the speed, dialect, and/or pitch of the message. In another embodiment, the recorded messages are automatically created corresponding to the user's own voice and speech patterns. In the preferred embodiment, a sample introduction from the number of sets of recorded messages is played for the user while the system is waiting for a selection from the user. When a selection is made by the user, the system confirms the selected recorded message by playing back a confirmation message using the same personality as the selected message. The recorded messages can be automatically selected for a given user/caller by using the Automatic Number Identification (ANI) information, Caller ID information, or voice recognition technology.

1 Still other embodiments of the present invention will
become readily apparent to those skilled in the art from the
following detailed description, wherein is shown and described
5 only embodiments of the invention by way of illustration of
the best modes contemplated for carrying out the invention.
As will be realized, the invention is capable of other and
different embodiments and its several details are capable of
modification in various obvious respects, all without
departing from the spirit and scope of the present invention.
10 Accordingly, the drawings and detailed description are to be
regarded as illustrative in nature and not as restrictive.

BRIEF DESCRIPTION OF THE DRAWINGS

15 FIG. 1 is a block diagram of the telecommunications
application hardware platform according to a preferred
embodiment of the invention.

20 FIG. 2 is a flow chart of the process used by subscriber
in conjunction with the preferred embodiment of selecting an
agent for that subscriber.

25 FIG. 3 is a flow chart of the process used by the system
for automatically selecting an agent using a combination of
ANI and voice recognition methods for caller identification.

DETAILED DESCRIPTION

30 A block diagram of the telecommunications application
hardware platform 10 used with the preferred embodiment is
shown in FIG. 1. The typical telecommunications applications
run on the platform include call answering (including voice,
fax and data processing), multimedia messaging, voice
recognition and call management. Despite having functionality
beyond handling voice calls, for convenience, the
35 telecommunications application hardware platform together with
its various telecommunications applications will be referred
to herein as the "voice mail system." The platform has three

1 main elements, a series of media modules 12, a series of
application modules 14 and a series of management modules 16.
These three series of modules are interconnected using a dual
5 high speed Ethernet backbones, centered around Ethernet Hub A
18 and Ethernet Hub B 20. Both Ethernet hubs are connected to
an Intranet 22, which allows the platform to communicate to
and receive commands from subscribers through their desktop
computers and through the Intranet. Alternatively, any
10 network other than traditional Intranets may be employed,
including the Internet. A principle kept in mind in the
design of the platform is the ability to offer extremely high
operational availability of the platform and applications
running on it.

15 The media modules 12 provide media storage, media flow
(play/record), media transformation (Digital Signal Processing
- DSP) resources and the telephony interfaces for the
platform. The media module is capable of playing and
recording multimedia messages (voice, fax, e-mail) from/to
20 disk as well as supplying tone detection/generation, voice
recognition, text to speech and fax modem services.

25 Each media module 12 uses N+1 power and RAID disk
technologies to enhance its reliability and availability.
Additionally, media modules are clustered to allow failover
between modules in the event one of them should fail.
Preferably, the operating system for the media module host CPU
is Solaris.

30 Application modules are NT servers hosting Microsoft's
Windows NT Server software. They host the applications and
database services for the platform. Communication with media
modules is via the media module API and remote procedure
calls. Like the media modules, the application modules make
use of N+1 power and RAID disks 30 and are themselves
clustered for high availability operation.

1 The management module 16 is a specialized version of an
application module. The management module is responsible for
hosting the cluster management services and call manager
5 application and is central point for the collection and
control of the platform fault management and alarming. To
support all of this, the management module contains extra
hardware for connection to media module consoles (not shown),
application module maintenance ports, and the system monitor.
10 The system monitor provides fault monitoring for each of the
elements of the platform as well as providing critical, major
and minor relay connections to the facility alarm grid. It
communicates with each management module across an RS232 link.
15 In some configurations, the platform management services and
applications may reside on the same NT servers.

15 The Ethernet hubs 18, 20 tie all of the media,
application, and management modules together. Each module has
dual 100 Base-T Ethernet connections 29 that terminate at two
separate Ethernet hubs 18, 20. There is a third 10 Base-T
20 Ethernet connection 24 between the media modules that is used
for a heartbeat for a failover mechanism.

25 A media module 12 consists of a 20 slot VME enclosure,
common control, T1 or E1 telephony interface cards, fax
service circuit cards (optional), and a storage subsystem.
All of these components are packaged in a NEBs compliant
cabinet enclosure.

25 The media module 12 has four main components: media
module enclosure power & package; common control;
telephony/DSP/service circuits/module; and media storage.

30 The preferred embodiments includes a pair of media
modules each of which can host up to a maximum of 240
telephony and 240 fax ports. However, alternative embodiments
include additional media modules.

1 The media module common control consists of the host CPU, SCSI host interfaces, Ethernet controllers and the environmental monitor.

5 The media module host CPU is packaged in a three slot, 6U VME bus module. The CPU requires a fourth backplane slot when Sbus modules are installed. The Sbus module carrier is used in the preferred embodiment. For the preferred embodiment the media module host CPU supports: Processor: Dual Hyper SPARC; 10 Memory: 64 to 512 MB ECC DRAM; Sbus: Two standard Sbus slots; SCSI: Two fast/narrow SCSI-2 ports; Ethernet: Two 10 Base-T Ethernet ports; and Serial I/O: Four RS 232 ports

15 The host CPU can support several daughter board processor modules. The preferred embodiment will use processor modules with speeds of either 125 MHz, 150 MHz, 166 MHz or 200 MHz depending on performance requirements. Single, dual and quad processor configurations are possible in alternate embodiments.

20 The host CPU can accommodate up to 512 MB of error correcting [ECC] memory in increments of 64 MB. The ECC provides single bit error correction and multiple bit error detection on a per byte basis. The amount of memory populated will depend on performance requirements.

25 The media module includes a 100 Base-T Ethernet controller that connects to the 100 Base-T Ethernet hub designated as network B. This network serves as the backup network for network A.

30 Each media module has an environmental monitor [EM] to monitor and report on the system's condition and operating environment. The controller is a single slot VME card which the CPU interrogates across the VME bus.

35 The environmental monitor provides: RAID power and fan status for up to 3 RAID shelves; Media Modules cabinet temperature; VME enclosure temperature; VME backplane voltage monitor (software readable): +5 volts, +12 volts, -12 volts;

1 Cabinet fan status; VME enclosure power and fan status;
Control of the display panel fault LED; Signaling of media
module faults to a management module; Remote VME bus reset (to
5 reset the buddy media module); Signaling a fault to a
management module for the buddy media module; Voltage test
points for VME backplane voltages; LED indicators for VME
backplane voltages; and 16 LED indicators for media module
fault conditions.

10 Telephone network and service circuit interface modules
provide the telephony, DSP and service circuit resources for a
media module. The modules are made up of a base board and one
or more daughter cards combined into a single 6U VME64 module.

15 The T1/Voice interface card consists of four T1 spans and
the DSP resources to support basis voice functionality for 96
channels. The configuration as described below occupies a
single VME backplane slot. VME base board with an Intel i960
processor, 4 MB of DRAM and two T1 spans; Dual span T1
daughter board; and Signal processor daughter board with six
20 Motorola 66 MHz 56303 DSPs.

25 The E1/Voice interface card consists of four E1 spans and
the DSP resources to support basis voice functionality for 90
channels. The forth span, allowing 120 channels, will be
enabled with in a future version of the hardware. The
configuration as described below occupies a single VME
backplane slot. VME base board with an Intel i960 processor,
4 MB of DRAM and two E1 spans; Dual span T1 daughter board;
and Signal processor daughter board with six Motorola 66 MHz
30 56303 DSPs.

35 The fax module has the processing resources to provide 24
channels of fax transmit and receive functionality in a single
VME slot.

A fax module consists of: VME base board with an Intel
i960 processor, 8 MB of DRAM; Signal processor daughter board
with six Motorola 66 MHz 56303 DSPs.

1 Media storage is accomplished using a dual controller
RAID system. The RAID configuration is 0+1 (mirrored and
stripped).

5 The specifics of the RAID system described here are
unique to the Artecon product. Alternatively, RAID systems
from other manufacturers may be used. SCSI bus termination is
done externally to the RAID controllers so that the
controllers may be hot swapped without interfering with the
10 SCSI bus termination.

10 An application module consists of an industrial grade PC,
common control, and a storage subsystem.

15 The preferred embodiment supports two pairs of
application modules and their storage subsystems packaged in a
NEBs compliant cabinet enclosure. Each pair of application
modules shares a single shelf dual controller RAID system.

Common control of an application module includes the host
CPU, a video controller, a SCSI controller, two Ethernet
controllers and an environmental monitor.

20 The host CPU is a passive backplane single board computer
with an ISA and PCI bus interface. It is designed to plug
into a PICMG compatible passive backplane that provides both
ISA and PCI card slots. For the preferred embodiment the
application module host CPU supports: Pentium Pro processor;
custom BIOS; 128 MB ECC DRAM; floppy controller port; IDE
25 interface; and two RS232 ports.

The processor in the application module of the preferred
embodiment is a Pentium Pro operating at a core speed of 200
MHz and a bus speed of 66.67 MHz.

30 The BIOS contains custom extensions to allow remote
serial communications with the host when the operating system
is not loaded. Communication is supported across comm port 1.
This remote preboot access permits maintenance personnel to
interrogate/modify the BIOS CMOS settings and to run
35 diagnostics when a system is off line.

1 The host CPU can support up to 512 MB of error correcting
[ECC] memory. The preferred embodiment provides 128 MB of ECC
memory. The ECC provides single bit error correction and
5 multiple bit error detection on a per byte basis.

5 Application modules are designed to operate without a
keybaord or monitor; however, a video controller is still
required by the Windows NT operating system to allow the
10 system to boot. All application modules are equipped with a
generic video controller. Depending on a particular system,
they may be either PCI or ISA cards. The video controller's
I/O is not routed to the bulkhead, but it is accessible from
the rear of the application module chassis.

15 Each application module has two PCI bus 100 MB Ethernet
interface cards. The Ethernet interface is 100 Base-T.

15 Each application module has an environmental monitor [EM]
to monitor and report on the system's condition and operating
environment. The controller is a single slot ISA bus card
which the CPU interrogates across the ISA bus.

20 The EM has a ISA slave interface that occupies 4 bytes in
the ISA I/O address space.

25 The environmental monitor provides: RAID power and fan
status; application module cabinet temperature; application
module cabinet fan status; PC enclosure temperature; PC
enclosure fan status; PC enclosure power status; host
processor (Pentium Pro) temperature; ISA/PCI backplane voltage
monitor: +5, -5 volts, +12 volts, -12 volts; control of the
cabinet's display panel fault LED; control of the PC
30 enclosure's thermal warning LED; signaling of application
module faults to a management module; CPU reset (to reset
itself) Note: a CPU reset resets all boards in the AM; remote
CPU reset (to reset the buddy application module); and
signaling a fault to the management module for the buddy
application module.

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1 The application module has a PCI, differential, fast/wide
5 SCSI-2 host controller for connection to the RAID system. For
compatibility with NT clustering, the controller's SCSI ID can
be changed programmatically.

5 Storage is accomplished using a dual controller RAID
system. The RAID configuration is 0+1 (mirrored and
stripped).

10 Again, SCSI bus termination is done externally to the
RAID controllers so that the controllers may be hot swapped
without interfering with SCSI bus termination.

15 The management module uses the same components as an
application module. In addition, it has peripheral storage
devices and expansion serial ports to accommodate
console/maintenance port connections and alarming.

15 The preferred embodiment was one pair of management
modules and their storage sub-system packaged in a NEDs
compliant cabinet enclosure.

20 A second PCI SCSI host controller that interfaces to the
tape drive is provided in management module 2 16b. This
controller has a single ended, fast/wide SCSI-2 interface.

25 A tape drive and CDROM are equipped in one of the
management modules. Failover/redundancy is not provided for
in these peripheral devices.

25 For doing database back ups, a four millimeter SCSI, DAT
tape drive is installed in management module 2 16b. The tape
is connected to a SCSI host controller separate from the one
used for the RAID system. The tape storage capacity is 4 GB.

30 For media distribution, installation and upgrade a 12x
speed CDROM is installed in management module 16a. The CDROM
interfaces to the host CPU's on board IDE bus.

35 The preferred embodiment uses dual IEEE 802.3 compliant
100 MB Ethernet networks to connect all of the internal
modules. Both networks are built around 12 port 100 MB
repeater hubs that connect to each of the networked modules.

1 Each hub has a single power supply. The hubs are
connected to separate input power feeds to allow maintenance
to be performed on one of them without disturbing the other.

5 Two ports from each hub are routed to the management
module's I/O bulkhead. These provide the external network
access to the cluster.

10 Each medial module can support a maximum of 240 telephony
ports. The ports can be either T1 or E1, but both may not be
mixed within the same backplane.

15 For a T1 system a maximum of three 4 span line cards may
be installed in each media module. In this configuration only
two of the four spans are usable on the third line card.

20 For an E1 system a maximum of three 3 span line cards may
be installed in each media module. In this configuration only
two of the three spans are usable on the third line card.

25 The preferred embodiment supports a 24 port fax card.
Each media module can accommodate a maximum of 10 fax cards
for a total of 240 fax ports.

30 The minimum number of disks allowed in any RAID
configuration is 3. In the media module the maximum number of
RAID disks allowed is 15 with 14 available for storage and 1
reserved for a global spare. In the application and
management modules the maximum number of RAID disks allowed is
7 with 6 available for storage and 1 reserved for a global
spare. In each RAID system two slots are reserved for
building new RAID sets when performing disk upgrades.

35 The platform is designed for modular hardware
serviceability. The following components support live
insertion/removal and may be added or replaced with no impact
on system operation: media module (including RAID disk drives
and controllers; VME & RAID power supplies & fans; telephone
network interface modules; fax service circuits; and CDROM
drive); and application module/management module (including

1 RAID disk drives and controllers; AM/MGM & RAID power supplies
5 & fans; and AB switch power).

5 If the need arises to replace a component that does not support hot swap, redundancy allows failing over to another resource during the maintenance period.

10 The platform provides the hardware capability to perform software upgrades without shutting the entire platform down. Upgrades are performed incrementally on each module until all 10 modules are at the new software level. There may be some degradation in the level of service during the time a module is being upgraded.

15 For upgrade purposes, a single media module may be removed from service, upgraded and returned to service with the only result being reduced port capacity during the down time interval.

20 An individual media module must be removed from service to upgrade any of the common control components.

25 Network interface modules are hot-plug and may be added or removed from a media module without service interruption.

Fax cards are hot-plug and may be added or removed from a media module with service interruption.

30 Increased storage upgrades are expected to occur with each advancement made in disk drive storage capacities. The platform architecture provides a transparent upgrade path that requires no down time to the media module being upgraded. Requirements for the upgrade are as follows: two open slots in the RAID subsystem; and all disk drives in a logical unit must be upgraded at the same time.

35 The upgrade capabilities for the application and management modules are identical.

The application modules are configured in redundant pairs. One application module may be removed from service and upgraded without interrupting service to the cluster.

1 Application and management modules must be removed from
service to service any of the common control components.

5 In the preferred embodiment there is no present need to
upgrade the Ethernet networks exists, however, the platform
Architecture allows for network upgrades to accommodate
expansion in future releases. As the cluster grows, the
network structure can be migrated to higher speed Ethernet,
ATM or other network technologies.

10 In the preferred embodiment, the application modules
include the applications that supply the functionality of
voice mail system that is apparent to a user of the voice mail
system. As stated above, the applications typically include
the functionality of call answering (including voice, fax and
data processing), multimedia messaging, voice recognition and
call management, it can include any telecommunications
functions. In the preferred embodiment, the application
includes several sets of pre-recorded messages. All of the
messages of a particular set of pre-recorded messages are
recorded by the same voice talent. However, different sets of
pre-recorded messages may be recorded by different voice
talents. Additionally, each set of pre-recorded messages is
recorded by the voice talent using the same basic speed,
dialect, pitch and personality. Of these different voice
qualities used in recording a set of messages, personality is
25 of importance. The same voice talent can record messages
using any of a variety of distinct personalities and emotional
qualities, such as happy, serious, verbose and terse. When
multiple voice talents are also used, the number and variety
of different voice/personality combinations is considerable.

30 The preferred embodiment then allows the user to select
one from the various sets of pre-recorded messages stored in
the application module. Once a set of pre-recorded messages
is chosen, that set represents the subscriber's chosen "agent"
35 for interacting with the voice mail system. In an alternative

1 embodiment, he selected pre-recorded message can be further
personalized by varying the speed, dialect, and/or pitch of
the message using digital signal processing techniques.

5 The preferred embodiment employs a brief interview
process shown in FIG. 2 to allow the user to select the agent
with the personality preferred by the user. When a subscriber
first uses the voice mail system, or decides to change their
agent, the selection process begins at entry point 30. In
10 block 32, the system begins waiting for a voice selection
response from the subscriber. At the same time, a Sample
Introduction, which introduces the agents to the subscriber,
is played. In one embodiment the Sample Introduction follows
the following script. In the following script, Agent #1 is
15 the default agent in the case of a new subscriber, or the
currently selected agent for an existing subscriber who is
changing their agent.

Agent #1: You may select among <number of voices
available (n)> assistants. This is what we
sound like . . .

20 Agent #1: It's either my voice, the one you've heard
before . . .

Agent #2: . . . or it's me. You can hear my voice . . .

. . .

25 Agent #n: . . . or you and your callers can hear my
voice.

Agent #1: For my voice, press 1.

Agent #2: For my voice, press 2.

. . .

30 Agent #n: For my voice, press <n>.

It is noted that the phrase used to introduce each new voice
(the "personality signature phrase"), such as Agent #2's ". . .
or it's me. You can hear my voice . . ." usually contains
slightly different words to make up the introduction. The

1 words used are chosen to be consistent with the agent's
5 personality.

5 If the user responds to the Sample Introduction by
10 pressing a key on their telephone between 1 and n, indicating
a valid choice of an agent, the branch to block 34 is taken.
In block 34, a message, spoken by the just-chosen agent,
states, "OK, I'll be your assistant from now on." Of course,
the words used by the chosen agent to communicate the choice
15 of that agent may be different for each agent, reflecting that
agent's personality. After block 34, the agent selection
process exits at block 38.

15 If the user does not respond to the Sample Introduction
or responds with an inappropriate key (not a number between 1
20 and n), the path from block 32 to block 36 is taken. In block
36, a message, spoken by the prior agent (Agent #1 in the case
25 of a new subscriber), states, "OK, I'll continue to be your
assistant." Again, the words used by the chosen agent to
communicate the retention of the prior agent may be different
for each agent, reflecting that agent's personality. After
block 36, the agent selection process exits at block 38.

25 With respect to the pre-recorded messages needed to
implement the agent selection process, the voice for each
agent must record each of the numbers from 1 to n and each of
the following phrases:

You may select among <number of voices available (n)>
assistants. This is what we sound like . . .

30 It's either my voice, the one you've heard before . . .;
["middle of list" intonation] <personality signature>;
["end of list" intonation] <personality signature>;
For my voice, press . . .;
OK, I'll be your assistant from now on; and
OK, I'll continue to be your assistant.
Each of these phrases is needed for each agent because the
35 current choice of agent, which could be any of the agents for

1 a particular subscriber, determines which agent's recordings
are used for each of the phrases. Again, the specific wording
used by a particular agent to convey the message of each of
5 the phrases can vary with the personality of the agent.

10 It has been found that even the short exposure to a voice
and personality that is given in the agent selection process
shown in FIG. 2 supplies subscribers with a sufficient amount
of information from which to choose a favorite agent. In
particular, most subscribers can immediately choose their
15 favorite voice/personality after listening to the short
personality signatures provided to them. Alternatively,
though, longer exposure to the different agents can be
provided. In another alternative, the system can conduct an
interview process to try to determine for the subscriber which
agent is most likely to appeal to them.

20 As voice mail system subscribers use a particular voice
mail system more often than outside callers, the choosing of a
personal agent is more important for subscribers than callers.
However, using ANI information contained in the data the voice
mail system receives with each incoming call that identifies
25 the calling stations phone number, the voice mail system can
automatically use a selected agent for all calls received from
a particular phone number. Alternatively, Caller ID
information or any other method of determining the calling
parties number can be used in place of or in addition to ANI
information. In this way, the time involved in selecting an
agent by a caller can be worthwhile for callers who call the
particular voice mail system often from the same phone number.
30 Alternatively, known voice recognition technology can be used
to identify incoming callers by analyzing the spoken response
to a system generated prompt, such as, "Hello, you've reached
the office of Joe Smith, whom may I say is calling?" The
response is then processed by the voice recognition software

35

1 and if the caller is recognized, the caller's choice of agent
5 is then used.

Fig. 3 illustrates a flow chart for a combination of the
5 ANI and voice recognition methods of caller identification, in
which a database is provided to store associations and
correlations between callers identified by the voice
recognition software and the number from which they have
called, according to the ANI information. Thus, when a call
10 comes into the system, the database is first checked to
determine if there are any entries corresponding to the ANI
information for the incoming call as shown by blocks 41 and
42. If there is only one entry for the calling number, the
system answers the call, "Hello, is this Joe Smith?" using
15 the agent that Joe Smith has chosen before. Then, analyzing
the response to this prompt, the voice recognition software
can verify that the caller's voice matches the systems records
for Joe Smith's voice as depicted by block 43 and 44. If the
response is a "yes" and the voice matches a record in the
20 database, i.e., a positive verification is confirmed in block
44, the system selects a pre-determined recorded message for
the caller as shown is block 46. If the voice does not match,
or says "No", i.e., not verified according to block 44, the
system first checks to determine if the voice of the response
25 matches any other records in the database as depicted by block
45. As illustrated by block 45, if there is a match, the
system asks if the caller is the person in the database for
the matching voice to verify their identity in block 44. If
there are more than one voice entry for the calling number,
30 the system searches the database for the given calling number
to find a match for the voice, shown by block 45, and then
proceeds to the verification step (block 44) as described
above. If the system does not find a match in the database
for the calling number or the voice, or if the caller does not
35 verify their identity as matching the person selected from the

1 database, the system proceeds to add a new entry for the
5 caller, with both the ANI information and voice pattern
10 information as demonstrated by block 47.

5 Using the same methods, a subscriber can be identified
when they call into the system from an outside telephone. In
10 this instance, the subscriber himself or herself has an entry
in the database. This database includes the subscriber's
various telephone numbers, such as home, office and mobile
15 numbers. Thus, if the system receives a call with ANI
information matching any of the subscriber's various telephone
numbers, there is a high likelihood that the caller is the
subscriber. When an outside caller is identified by the
20 system as a subscriber, that subscriber's agent is used to
handle to call.

15 The identification methods also allow a subscriber to
select an agent for anyone in their address book. This is of
particular usefulness when the subscriber knows that a person
in the database is more comfortable with a language different
25 than the language used by the system's default agent. In an
example of this situation where a particular caller prefers to
speak French, the subscriber can have the voice mail system
always use a French language agent once it has identified that
30 caller.

25 Additionally, the voice mail system can be set up to
allow outside callers who are frequent users of the voice mail
system to choose an agent that is preferable to them. Again,
as with the caller who prefers a different language, once the
35 caller is identified by the voice mail system, the database is
accessed and the caller's chosen agent is used for the
duration of the call. In this case, though, no subscriber
involvement is necessary in the selection of the preferred
agent for that caller.

35 In an alternative embodiment, using known weaving
technology (voice patterns of someone reading a sentence or

1 paragraph are taken and the words/phonemes in the sample are
used to make new sentences) the system can create an agent
based upon the user's own voice and speech patterns. Thus, a
5 user reads a paragraph (or however much sample is needed) and
the recording of that reading is used to automatically create
the pre-recorded messages for that user's agent.

10 The database that stores information about callers based
on ANI information, voice recognition or a combination of
these techniques allows further functionality to the voice
mail system apart from the selection of a preferred agent
personality. This additional functionality centers around the
concept of a personal assistant, enabled by expanding the
15 incoming caller database into a telephone user interface (TUI)
address book. The address book contains phone numbers, fax
numbers, other numbers, e-mail addresses and other information
that will facilitate intelligent handling of calls to and from
the people in the address book.

20 Each entry in the address book contains an entry number,
a caller-spoken name utterance, a subscriber-spoken utterance
of the entry's name, the entry's phone number, and the entry's
fax number (optional). As caller messages are left for the
subscriber with the voice mail system, the caller-spoken
names, ANI and keyed-in phone numbers are saved with the
25 message (if requested by the greeting option selected and
given by the caller). When the subscriber has listened to a
message for which at least some phone number information is
available, one option that becomes available is to add this
caller to the address book. If this option is selected, the
30 voice mail system will prompt the subscriber to say the spoken
name of the caller, verify the phone number to be stored, and
enter the fax number if available and not already entered by
the caller.

35 Names may also be added manually by selecting the
appropriate option under a "Setup/Address Book" menu of the

1 voice mail application. After selecting the slot into which
the entry will be placed, the subscriber-spoken utterance of
the entry's name, the phone number and the fax number are
5 entered manually.

10 Each slot in the address book is numbered, starting with
one. When a person is assigned to a slot, they stay there with
that number until manually deleted or replaced via the address
book maintenance options (Add, Change, Delete, Review One,
15 Review All) in the "Setup/Address Book" menu. Deletions do
not reorder the list, and additions are placed in the slot
number specified by the subscriber (the first available slot
is suggested by the system). Any information in a slot may be
replaced (Change command).

20 One function available to the system with TUI address
book is calling people from the information in the address
book. To call a person in the address book the subscriber
presses a number associated the person. If there are 10 or
more entries, the selection of the entry to dial is considered
complete when the "#" key is pressed or a timeout occurs. If
the number of entries is less than 10, the attempted outdial
25 occurs immediately upon receipt of the single-digit keypress,
without waiting for a timeout. The phone number from the
address book is then used to dial the desired person.

30 Alternatively, the phone number for a person in the
address book can be dialed when the subscriber speaks the
person's name to the voice mail system, using voice
recognition. In one embodiment, the voice recognition relies
on the subscriber having spoken the person's name to the voice
mail system when the person's address book record was created.
35 In another embodiment, a voice recognition name template is
created from the text representation of the person's name and
stored as an entry in the address book. The person is then
dialed by a voice command matching the voice recognition name
template.

1 Another feature is automatically adding an entry to the
5 subscriber's address book from the information stored in an
 incoming voice message to the subscriber. Particularly if the
 voice mail application prompts the caller to say their phone
10 number at a particular point in the call, the phone number is
 converted into digits which are automatically stored in the
 caller's entry in the address book should the subscriber add
 the person to the address book. The address book also allows
 the automatic addition of a person to the subscriber's address
 book from the information stored in an incoming e-mail message
 to the subscriber.

15 The system stores extensive information about the
 subscriber's use of a particular entry in the Address Book as
 part of the entry. Thus, for example, when there is a
 question by the voice recognition software whether the
 subscriber said "John Smith" or "Joe Smith," the system can
 make an intelligent guess that the subscriber intended to dial
 Joe Smith because that subscriber calls Joe Smith once a week
 on average and that subscriber hasn't called John Smith in
 over six months.

20 The system also stores information about the number and
 frequency of calls from a particular entry in the address book
 as part of the entry, as well as storing information about how
 the subscriber treats this caller and/or messages from this
 caller. With this information, the system can predict how the
 subscriber will want to treat a particular call/message. For
 example, if the subscriber always immediately returns calls
 from their mother, the voice mail system presents the message
 from the subscriber's mother and automatically asks if the
 subscriber would like the system to place a return call
 immediately. Alternatively, if a subscriber routinely sends
 calls from a particular caller to be answered by the voice
 messaging function, the system will present the call with a
 statement such as, "Mr. X is calling, I will route the call to

1 voice mail unless you press the star key . . ." The same
5 information can be used by the voice mail system to make an
internal decision to promote an address book entry to a VIP
list based on subscriber's treatment of calls and messages
from entry.

10 In an alternative embodiment, a visual graphic based
computer interface is used to communicate between the voice
mail system and the subscribers in all of the functions
described above instead of using voice based menus used over
the subscriber's phone as described above.

15 Another feature of the preferred embodiment is
automatically adjusting which pre-recorded messages are played
at different points in user interaction based upon the user's
competence in interacting with the system, as perceived by the
voice mail system. In almost any particular point in the
interaction with a voice mail system, while there is one
particular piece of information that needs to be communicated
to the user, the manner of communicating this information can
range greatly along the spectrum from terse to verbose.
20 Generally, experienced users prefer more terse messages while
inexperienced users appreciate more verbose messages. In a
preferred embodiment, the system monitors various parameters
such as the frequency at which the user reaches a particular
25 point in the system where a message is played, errors made by
the user (determined by hangups followed by immediate return
calls, backups in a menu hierarchy, etc.), multiple long
pauses without user input at the same point in the system on
consecutive calls (as opposed to singular pauses which may be
30 the result of the user being distracted/interrupted while
using the system), and how quickly a user interrupts a message
with a selection (e.g., DTMF tone).

35 A preferred embodiment allows the use of these detection
criteria to be used both for changing the message played at a
local point in the system or for making global changes in the

1 level of message played to a particular user. This process is
5 called flexing the prompt levels and the specific way the
various parameter are programmed to affect the flexing of
prompt levels is called the flex behavior of the system. Of
course, the user is allowed to override the system and
manually select the terseness of messages either locally or
globally. Last, as with the selectable agent personalities,
10 while mostly applicable to internal users of the system, the
invention may also be applied to incoming callers, identified
by the ANI information received with the call or any other
manner of identifying the caller, including voice recognition
as discussed above.

15 The system also allows the fine-tuning of the flex
behavior by individually setting all of these "flex-triggers"
on a state-by-state basis, allowing the application designer
very precise control over flex behavior throughout the
application. For example, items on the main menu, used more
frequently, might flex after 5 correct uses, whereas the
20 selection of a greeting style (which includes a long preamble
before the menu at the beginner level) might flex after only
two uses.

25 Further, this would also allow an entire set of flex
settings to be associated with a "language," allowing the
application designer to adjust flex behavior to be appropriate
for various languages/personalities provided with the
application.

30 In a preferred embodiment, there are three levels of
prompting and four possible settings of a subscriber's prompt
level:

35 Flex - this setting automatically adjusts prompts among
the three available levels to accommodate the
subscriber's experience level at a number of pre-defined
states in the user interface, adjusting the level up (or
down) as appropriate.

1 Training - these are explanatory prompts that provide all
of the information a subscriber might require to
understand what the next appropriate response on their
part needs to be.

5 Standard - these are concise prompts, asking for the
subscriber's response directly, with little or no
explanation; they assume the subscriber has progressed
beyond the "training" stage.

10 Advanced - these are tightly edited prompts, using as
little verbiage as possible to prompt for the desired
response.

15 When the Flex level is selected, at pre-defined states in
the user interface, the preferred embodiment adjusts its
prompts among the three available levels to match the
subscriber's level of experience with a particular activity.
In any state within which prompt level is not tracked, prompt
level is inherited from its parent state.

20 In order to adjust prompt levels appropriately, the
system tracks the subscriber's experience at each of the
predefined states within the call flow, adjusting in either
direction based on both usage and the length of time since the
last use of the function. For example, if the subscriber
successfully completes a given action (based on valid
keypresses and/or error tones received) a certain number of
25 times, the prompts are abbreviated by one level. If, on the
other hand, they fail a certain number of times, or if they
have not attempted this particular action for more than "n"
calendar days, the prompts are lengthened by one level.

30 The flex level is also adjusted based upon a combination
of the total number of times a particular menu item has been
used by a subscriber and the number of uses in a recent time
period by the subscriber. Thus a subscriber who has used a
menu item many times in the past, but has not used it in the
35 last three months may be given a lower flex level than a

1 subscriber who has not use the menu item nearly as many times total, but has used the menu item ten times in the last week. On the other hand, the subscriber who has used the menu item 5 many times in the past, but has not used it in the last three months should probably be placed at more advanced flex level than a subscriber who has used the menu item only two times, but both uses were in the last month.

10 Whenever the subscriber responds to a particular prompt with silence, the Training level's version of that prompt is played next, providing more information about the response expected (no permanent adjustments are made to prompt level; this is isolated behavior on a prompt-by-prompt basis).

15 The subscriber has the option to lock all interaction at a certain level, regardless of experience. (In areas where lack of instruction could result in loss of information or other undesirable result, verbose prompts are given, even at the Advanced level).

20 Although the invention has been described with reference to specific embodiments, this description is not meant to be construed in a limiting sense. Various modifications of the disclosed embodiments as well as alternative embodiments of the invention will become apparent to one skilled in the art upon reference to the description of the invention. It is 25 therefore contemplated that the appended claims will cover any such modifications of the embodiments that fall within the true scope of the invention.

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